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**THE ECONOMIC IMPACT OF ENVIRONMENTAL
PROGRAMS**

Council on Environmental Quality
Washington, D. C.

December 1974

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THE ECONOMIC IMPACT OF ENVIRONMENTAL PROGRAMS

The Council on Environmental Quality (CEQ) has, since its inception, taken a major responsibility for assessing the economic abatement costs the Nation can expect to face as a result of current Federal environmental legislation.¹ The Council carries out other in-house analyses or contracts for studies concerning the economic impact of these programs. This memorandum summarizes CEQ's 1974 estimates and analyses. Additional supporting papers are available upon request. (See page 24.)

1974 Abatement Cost Estimates

The CEQ's estimate of abatement costs for the ten-year period 1973 through 1982 are given in Table I. These "incremental" abatement costs are those abatement costs projected to meet the requirements of Federal environmental legislation enacted since the mid-sixties, beyond what the Nation would have spent for the same purposes in the absence of this legislation. Four types of costs are shown:

- "Investment costs" (for the period 1973-1982) which are the estimated expenditures which will be made on capital equipment for pollution abatement by both public and private sectors.
- "Capital costs" which include interest charges on pollution control investments and the depreciation of the capital equipment.
- "O&M costs" which are the costs of operating and maintaining the pollution abatement processes.
- "Annual costs" which are the sum of the capital costs and the O&M costs. The last column in Table I shows the sum of annual costs projected for each of the ten years 1973, 1974,...1982.

These abatement costs are estimated primarily from data provided by the Environmental Protection Agency (EPA) and other Federal agencies. The air pollution abatement costs are based primarily

TABLE I

ESTIMATED INCREMENTAL POLLUTION
CONTROL EXPENDITURES¹

[In billions of 1973 dollars]

Pollutant/medium	1973			1982			Cumulative - 1973-82		
	O&M ²	Capital costs ³	Total annual costs	O&M ²	Capital costs ³	Total annual costs ⁴	Capital investment	O&M ²	Total annual costs ⁴
Air pollution	.1	.1	.2	.5	.2	.7	1.7	3.8	5.4
	Public								
	Private								
	Mobile	1.2	1.4	8.4	4.9	13.3	31.3	49.9	74.4
	Industrial	.5	1.2	1.3	1.1	2.4	8.4	11.6	24.5
Utilities	.5	.3	.8	2.7	1.2	3.9	7.9	19.6	29.0
	Total	2.3	3.6	12.9	7.4	20.3	49.3	84.9	133.3
Water pollution									
	Public								
	Federal ⁶	(.2)	NA	(.2)	NA	NA	1.8	NA	NA
	State and local	1.1	1.2	1.4	1.3	2.7	14.8	12.8	24.4
	Private	.5	1.0	1.5	1.2	2.7	9.8	12.3	23.1
Industrial	0	0	.01	.4	.3	.7	4.4	2.2	3.5
	Utilities	1.6	2.2	3.3	2.8	6.1	29.0	27.3	51.0
	Total ⁷	(1.8)		(3.5)			(30.8)		
Radiation									
	Nuclear powerplants	NA	NA	.05	.05	.1	.3	.08	.3
	Solid waste								
	Public	.1	.2	.3	.1	.4	1.0	2.2	2.9
	Private	.1	.1	.5	<.05	.5	<.05	2.3	2.3
Land reclamation ⁵	.2	.1	.3	.8	.1	.9	1.0	4.5	5.2
	Surface mining	.3	.3	0.6	0	.6	0	5.0	5.0
	Noise ⁶	NA	NA	NA	(1.0-1.4)	NA	(6.0-8.7)	NA	NA
Grand total ⁷	4.4	2.0	5.4	17.7	10.3	28.0	79.6	121.8	194.8
	(4.6)	(2.1)			(11.3-11.7)		(87.4-90.1)		

1/ Incremental costs are expenditures made pursuant to Federal environmental legislation, beyond those that would have been made in the absence of this legislation.

2/ Operating and maintenance costs.

3/ Interest and depreciation.

4/ O&M plus capital costs.

5/ Includes coal mining only.

6/ Not included in grand total.

7/ Numbers without parentheses do not include expenditures made to abate water pollution from Federal facilities or expenditures from noise abatement; numbers in parentheses include both here and elsewhere.

on the 1974 edition of The Cost of Clean Air,² and the private water pollution abatement costs are based primarily upon the 1973 edition of The Economics of Clean Water.³ The cost estimates predominantly assume the installation of "end-of-the-pipe" treatment for air and water pollution abatement, and thus understate potential for less costly production process modifications which also satisfy legislated abatement requirements. For this reason, and because CEQ's unit cost assumptions are generally high, the cost estimates are considered to define, on the basis of current knowledge, the maximum likely costs the Nation will experience. However, not all of the costs associated with meeting the 1983 goals of "best available technology" are included because of uncertainty about the degree of abatement that will be required for many industries.⁴

Cumulative abatement costs (in constant 1973 dollars) over the 1973-82 period are estimated to be \$194.8 billion. This estimate is approximately \$42.1 billion (28 percent) higher than last year's estimate. However, only \$10.1 billion of this increase represents a net increase in real cost estimates (primarily stationary air pollution control). The remainder of the increase resulted from:

- Changing the estimating period from 1972- 81 to 1973-82 (in essence, dropping 1972, a relatively low cost year, and adding 1983, a higher cost year). \$20.5 billion
- Inflation (changing from 1972 dollars to 1973 dollars). \$11.5 billion

Distribution of Costs by Sector: Approximately \$77 billion of the cumulative costs (mobile sources and solid waste collection costs) is paid for directly by the consumer. Another \$32 billion is initially paid by government and passed through to taxpayers. Of the remainder, \$32 billion will be paid by electrical utilities and the rest by other industries. These costs will be predominantly passed on to the consumer in the form of higher electricity and product prices.

TABLE II
INVESTMENT FOR AIR AND WATER
POLLUTION ABATEMENT BY INDUSTRIES, 1973
(in millions of dollars)

	Total plant & expenditures	Pollution abatement investment					
		End-of-the-pipe & process change			Process change only		
		Total	Air	Water	Total	Air	Water
All industries-----	100,076	4,938	3,176	1,762	1,169	724	444
Manufacturing-----	38,003	3,153	2,050	1,103	712	446	266
Durable goods -----	19,389	1,579	1,207	372	321	220	101
Primary metals -----	3,481	814	712	101	112	82	29
Blast furnace, steel works-----	1,407	230	163	67	75	56	19
Nonferrous-----	1,679	523	492	31	29	19	9
Electrical machinery-----	2,895	129	44	85	35	14	21
Machinery, except electrical-----	3,478	80	52	28	36	24	12
Transportation equipment-----	3,063	170	96	74	37	20	17
Motor vehicles-----	2,244	143	81	62	35	19	16
Aircraft-----	531	20	11	10	0	0	0
Stone, clay, & glass-----	1,503	144	123	22	50	42	8
Other durables -----	4,969	243	180	63	52	37	15
Nondurable goods -----	18,614	1,574	843	731	391	226	165
Food including beverage-----	3,048	152	68	84	49	25	24
Textile-----	787	29	9	20	11	3	8
Paper-----	1,893	355	174	181	14	7	7
Chemical-----	4,324	416	203	213	149	88	61
Petroleum-----	5,409	555	352	203	151	94	57
Rubber-----	1,567	48	26	23	12	6	6
Other nondurables -----	1,586	19	12	7	5	4	1
Nonmanufacturing-----	62,073	1,785	1,126	659	457	278	179
Mining-----	2,759	91	41	50	20	15	5
Railroad-----	1,939	16	5	11	5	3	2
Air transportation-----	2,413	15	12	4	2	2	0
Other transportation-----	1,605	11	6	5	4	3	1
Public utilities-----	19,087	1,451	921	530	386	226	160
Electric-----	16,250	1,409	906	503	372	223	149
Gas & other -----	2,837	42	15	27	14	3	11
Communication, commercial, & other -----	34,270	201	142	58	41	31	10

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, vol. 54, July 1974.

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Distribution over Time: In terms of the timing of expenditures, investments are expected to increase steadily up to a peak in 1976 in order to meet the 1971 goals of the Clean Air Act and the Federal Water Pollution Control Act. Annual costs are expected to increase at a rapid rate through 1977 after which they will level off.

Distribution between Investment and O&M Costs: In terms of real resource costs, CEQ estimates that there will be \$81.4 billion invested in capital equipment and \$121.8 billion spent on operation and maintenance costs over the 10-year period. As noted earlier, this estimate of investment costs is thought to be too high because of the emphasis placed on "end-of-the-pipe" capital investments as opposed to less investment-intensive process charges. The Bureau of Economic Analysis (Department of Commerce) in a recent survey of pollution abatement investments (see Tables II and III) found them to be somewhat lower than the CEQ estimates.⁵

As Tables II and III indicate, the BEA survey provides the first information about the relative importance of process change as opposed to "end-of-the-pipe" treatment for pollution abatement. In 1973 and 1974, 23 percent of the total investment for pollution abatement was expected to be allocated for process changes.

Macroeconomic Impacts

The macroeconomic impacts of environmental expenditures were analysed by CEQ, with the help of the Chase Econometrics, Inc., macroeconomic model.⁶

In 1974, the estimated incremental real resource (investment plus O&M) abatement costs amounted to approximately 1.0 percent of the U.S. Gross National Product. This proportion is expected to increase to approximately 1.7 percent in 1976, and then decrease thereafter as investment costs decrease and GNP continues to grow.

TABLE III
INVESTMENT FOR AIR AND WATER POLLUTION
ABATEMENT BY INDUSTRIES, 1974
(in millions of dollars)

	Total plant and expenditures	Pollution abatement investment					
		End-of-the-pipe & process change			Process change only		
		Total	Air	Water	Total	Air	Water
All industries-----	112,114	6,543	4,346	2,196	1,465	1,003	462
Manufacturing-----	44,404	4,446	2,929	1,517	1,042	721	321
Durable goods-----	22,611	2,063	1,523	540	499	397	102
Primary metals-----	4,337	1,003	841	163	250	239	11
Blast furnace, steel works-----	1,712	381	304	78	114	109	4
Nonferrous-----	2,156	553	469	83	118	111	6
Electrical machinery-----	3,179	175	53	122	46	16	30
Machinery, except electrical-----	3,975	118	74	44	42	27	15
Transportation equipment-----	3,570	195	112	83	29	17	12
Motor vehicles-----	2,682	178	103	75	28	17	12
Aircraft-----	580	13	7	6	0	0	0
Stone, clay, & glass-----	1,683	282	244	39	58	48	10
Other durables-----	5,867	290	200	90	73	50	23
Nondurable goods-----	21,793	2,383	1,406	977	543	324	220
Food including beverage-----	3,276	230	112	118	67	35	32
Textile-----	773	43	17	26	7	3	4
Paper-----	2,484	500	326	174	31	16	15
Chemical-----	5,249	608	293	316	188	109	79
Petroleum-----	6,888	926	610	316	239	153	86
Rubber-----	1,580	51	33	18	8	6	2
Other nondurables-----	1,543	24	16	9	5	2	2
Nonmanufacturing-----	67,710	2,097	1,418	679	423	283	140
Mining-----	3,143	100	53	47	28	22	6
Railroad-----	2,272	19	3	16	3	2	2
Air transportation-----	2,160	9	4	5	1	0	0
Other transportation-----	1,617	17	10	7	5	3	2
Public utilities-----	22,163	1,696	1,179	518	307	200	107
Electric-----	18,808	1,651	1,160	491	295	197	98
Gas & other-----	3,355	46	19	27	11	2	9
Communication, commercial, & other-----	36,355	256	170	87	80	57	23

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, Vol. 54, July 1974.

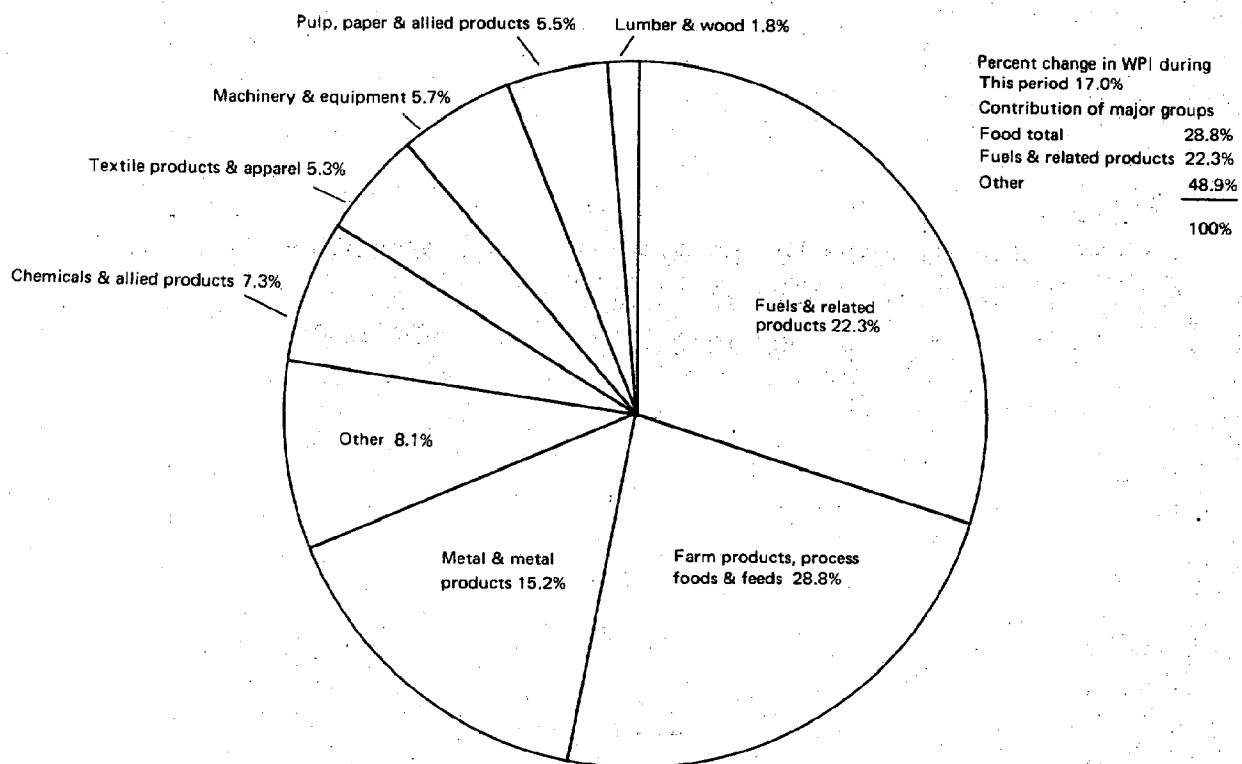
Estimated private pollution control investments (excluding mobile sources) amount to approximately 3 percent of gross private domestic investment and 6 percent of business investment in plant and equipment in 1974. These ratios are expected to remain approximately constant through 1976 after which they will fall.

Impact on Inflation: The impact of these expenditures on the rate of inflation has been estimated in two ways. One estimate compares the price increases expected in different economic sectors as a result of pollution control expenditures with the contribution of these expenditures to the rate of inflation. As Figure I indicates, much of the increase in the wholesale price index (WPI) over the past year has occurred because of increased energy (predominantly oil) and food prices. The cost of producing crude oil and unprocessed food is virtually unaffected by pollution control expenditures. Calculating the impact of the remaining sectors involved weighting the contribution of each to the increase in the WPI by the price increase expected in each sector as a result of direct and indirect pollution control costs. These calculations indicate that pollution control expenditures were responsible for approximately 0.5 percent (one-fortieth of the total increase of 17 percent) in the WPI from 1973 to 1974.

This result was confirmed by three separate analyses using sophisticated macroeconomic computer models. The first was the 1973 Chase Econometrics macroeconomic analysis which predicted an increase in the WPI of 0.5 percent during 1974 as a result of pollution control expenditures.⁷ Two other similar analyses have been run by the Brookings Institution and by Data Resources, Inc.⁸ Both show inflation rates of 0.3 percent to 0.5 percent per year resulting from pollution control expenditures. The Chase projections of price increases resulting from pollution control expenditures are given in Table IV.

Impact on Investment, Productivity, and Economic Growth: One of the concerns currently being expressed about environmental programs is that the substantial investments they require will displace investments that firms would otherwise be making to expand or modernize their production capacity. Such a substitution, if it were to occur widely, could have an adverse impact on the rate of increase in labor productivity because firms

FIGURE I
Percent Contribution to Change in Wholesale Price Index,
April 1973-April 1974
(by Major Commodity Groupings)



Source: Cost of Living Council, 1974, based on Bureau of Labor Statistics data.

TABLE IV

PERCENTAGE CONTRIBUTION
OF POLLUTION ABATEMENT EXPENDITURES
TO PROJECTED CHANGES IN PRICE INDICES

	CPI	WPI	GNP deflator
Increase 1975/76	0.5%	2.0%	0.9%
Cumulative increase to 1976	0.8%	2.6%	1.2%
Average increase 1973/76	0.3%	0.9%	0.4%
Increase 1981-82	-0.2%	-0.1%	0.0%
Cumulative increase to 1982	0.3%	2.4%	0.9%
Average increase 1973/82	.03%	0.2%	0.1%

CPI = Consumer price index
WPI = Wholesale price index

Source: Based on Chase Econometrics, Inc., (1974) estimates.

would be operating with older, less productive equipment. And this reduced productivity growth would result in a lower rate of economic growth for the Nation.

The available data indicate that such effects are likely to be minimal. The maximum projected investment for environmental purposes by U.S. industries is unlikely to exceed 6 percent of their total plant and equipment expenditures in any one year, and should average approximately 3 percent of these expenditures over the 10-year estimating period.

The pollution control expenditures will, of course, place increased demands on the capital market and will displace some private investment, but the Chase Econometrics analyses conclude that the displacement will predominantly be in areas other than plant and equipment expenditures, such as residential construction.⁹

This conclusion is at least partially confirmed by the results of the first Bureau of Economic Analysis survey of pollution control expenditures, in which only 2 percent of the firms sampled claimed that pollution control expenditures had displaced any of their planned investments for expanding or modernizing their production capacity.

FIGURE II
Projected Economic Growth, 1974-1982

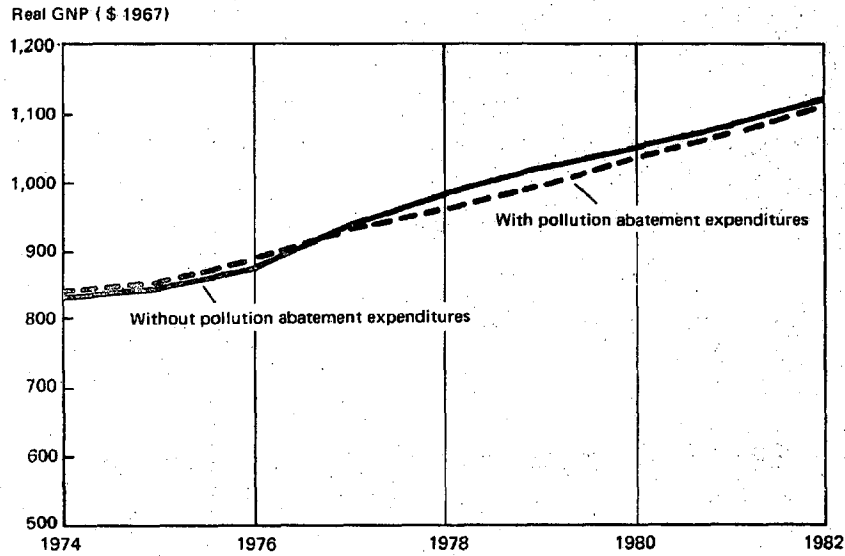
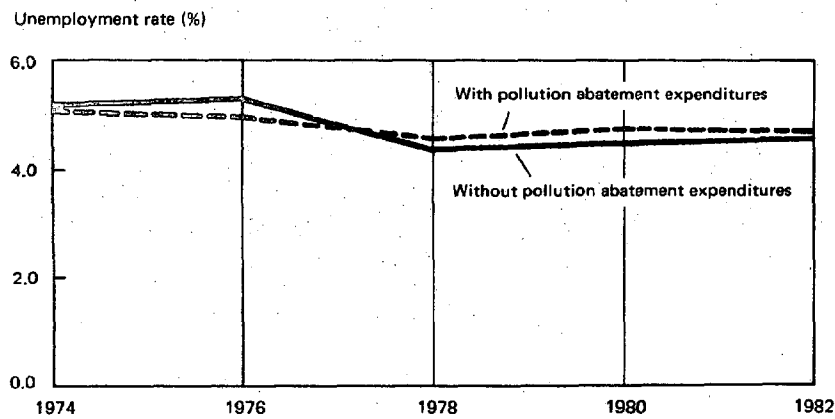


FIGURE III
Projected Unemployment Rates, 1974-1982



The BEA report concluded, "While it is possible that in some industries pollution abatement restrictions have caused a reduction in investment, the low level of positive response to this question indicates that business as a whole does not think of pollution abatement regulations as reducing investment in new plant equipment."¹⁰

In light of these findings, pollution control expenditures are not expected to delay significantly the expansion or modernization of industrial capacity for producing goods and services, and therefore are not expected to have a measurable adverse impact on labor productivity.

If environmental expenditures have an insignificant impact on plant and equipment expenditures and therefore on productivity, they will have virtually no impact on the rate of growth of the "full employment GNP." However, according to the 10-year forecast by Chase Econometrics, the anticipated peaking of environmentally related expenditures prior to 1978 will create a minor business cycle which will affect the actual growth rate in GNP. These expenditures are expected to stimulate the economy prior to 1976 so that the GNP in current and constant dollars will be higher than it otherwise would have been. After 1976 the slightly higher prices resulting from pollution control expenditures will have a minor depressing effect on the economy, causing the real GNP to dip below the level expected without environmental expenditures. By 1982 this depressing effect is expected to disappear, so that the GNP will be at the same level as it would have been without environmental improvement programs. The projected GNP levels are summarized in Figure II.

Impact on Employment: The impact of environmental expenditures on employment is projected to be insignificant. In the macroeconomic analyses the impact of unemployment is expected to mirror the impact on GNP: before 1976 there will be less unemployment than there otherwise would have been, from 1977 to 1980 there will be somewhat more; but by the end of the decade there will be no significant impact on unemployment. Projected employment rates are given in Figure III.

These macroeconomic analyses do not take account of plant closings caused by environmental regulations, however. EPA, which maintains an "Economic Dislocation Early Warning System" on such closings, had received reports of 69 firms which claimed that they had been

TABLE V

PLANT CLOSINGS WHERE POLLUTION CONTROL COSTS WERE ALLEGED
TO BE FACTOR, JANUARY 1971-JUNE 1974

INDUSTRY \ REGION		Paper & allied products	Primary metals	Chemicals & allied products	Food products	Stone, clay, glass & concrete products	Mining & quarrying non-metal minerals	Textile mill products	Other industries	TOTAL
I Plants		2						3	1	6
I Employees		1,013						-	95	1,108
II Plants		3	1	3	1	1	1	8	18	
II Employees		1,536	44	1,450	102	25	133	1,308	4,598	
III Plants				2	2			3	7	
III Employees				610	105			390	1,105	
IV Plants			1	1					2	
IV Employees			148	78					226	
V Plants		2	5		3	3		1	14	
V Employees		500	1,379		165	235		-	2,279	
VI Plants			3					1	4	
VI Employees			540					45	585	
VII Plants										
VII Employees										
VIII Plants				1			2		3	
VIII Employees				-			208		208	
IX Plants			2		2	2	1	2	8	
IX Employees			400		-	148	35	529	1,112	
X Plants		3			1			2	6	
X Employees		833			38			250	1,121	
TOTAL										
Plants		10	12	7	9	5	4	18	68	
Employees		3,882	2,511	2,138	410	383	268	133	2,617	12,342

1/ Dislocation involving less than 25 jobs is not reported.

2/ "Other industries" includes all dislocations where the combined "actual" and "threatened" plants amount to fewer than six.

Source: Environmental Protection Agency, Office of the Administrator, 1974 Second Quarter Report of the Economic Dislocation Early Warning System.

forced to close plants from January 1971 through June 1974, at least in part because of environmental regulations. These plants represented a total of approximately 12,000 jobs (about .015 percent of the current labor force). The details on these closures are given in Table V.

It should be noted that the increase in unemployment caused by these plant closings will be less than the 12,000 jobs that the plants themselves represented. The lost production will be shifted to other plants, sometimes within the same firm, and as a result more jobs will be created at these other plants. There is probably some net loss in jobs because the plants which increase production are likely to be more efficient than the plants which close. It is the relative inefficiency of these plants -- they are likely to be older, smaller facilities which are only marginally profitable even without the requirement that they install environmental controls -- that leads the firm to conclude that they should be closed rather than modernized. In many instances they would have been closed soon anyway, and environmental regulations tend only to accelerate an otherwise inevitable process.

However, the problem of plant closures should not be understated. As Table V indicates, there is some geographical concentration of the plants which have closed. Many of these plants are also often located in older, industrial towns already suffering relatively high unemployment rates. Their closures can be a serious blow to the local economy and particularly to the workers who may have serious difficulty finding other employment.

Impact on Government Finances: The major sources of government expenditures associated with the implementation of Federal environmental legislation are for municipal sewage treatment plants, solid waste collection and disposal, and air and water pollution abatement from publicly owned facilities. At the Federal level, the EPA sewage treatment grants program has become the second largest public works activity exceeded only by the Federal highway program. Nevertheless, as indicated in Table VI, environmental expenditures still account for only 1.0 percent of total Federal outlays in FY '74 and 1.3 percent in FY '75.

On the state and local levels, because the Federal Government is presently paying a large proportion (up to 75 percent) of the investments required for municipal sewage collection and treatment works, CEQ projects local government environmental expenditures to be lower than they would have been in the absence

TABLE VI

U.S. BUDGET OUTLAYS BY FUNCTION
1973 ACTUAL AND 1974-76 ESTIMATED

[in billions of dollars]

Description	1973 actual	1974 estimate	1975 estimate	1976 estimate
Function:				
National defense	76.0	80.6	87.7	94.8
International affairs & finance	3.0	3.9	4.1	4.3
Space research & technology	3.3	3.2	3.3	3.4
Agriculture & rural development	6.2	4.0	2.7	4.1
NATURAL RESOURCES & ENVIRONMENT	.6	.6	3.1	4.1
Commerce & transportation	13.1	13.5	13.4	13.7
Community development & housing	4.1	5.4	5.7	7.4
Education & manpower	10.2	10.8	11.5	12.3
Health	18.4	23.3	26.3	28.6
Income security	73.1	85.0	100.1	107.2
Veterans benefits & services	12.0	13.3	13.6	13.8
Interest	22.8	27.8	29.1	30.4
General government	5.5	6.8	6.8	6.9
General revenue sharing	6.6	6.1	6.2	6.3
Allowances	--	.3	1.6	4.4
Undistributed intragovernmental transactions	-8.4	-10.0	-10.7	-11.6
Total	246.5	274.7	304.4	329.4

DETAILS FOR NATURAL RESOURCES AND ENVIRONMENT

[in billions of dollars]

	1973 actual	1974 estimate	1975 estimate
Pollution control and abatement	\$1.1	\$2.6	\$4.0
Recreational resources	.6	.8	.8
Water resources and power	2.9	2.9	3.0
Land management	.9	1.0	1.1
Mineral resources	.1	.3	.3
Other natural resource programs	.2	.2	.2
subtotal all programs	5.8	7.8	9.4
Deduction for offsetting receipts	-5.2	-7.2	-6.3
Net total	\$0.6	\$0.6	\$3.1

Source: Office of Management and Budget, The Budget of the United States Government: Fiscal Year 1975 (U.S. Government Printing Office, 1974), p. 86.

of Federal legislation. The fiscal impact of local expenditures will also be reduced by the fact that many of these costs -- e.g., for sewage treatment and solid waste collection -- are likely to be financed out of user charges rather than general revenues.¹¹

Impact on Foreign Trade: Analyses conducted by the Department of Commerce, other Federal agencies, and independent analysts have not succeeded in identifying any significant impact of our environmental regulations on our foreign trade and balance of payments.¹² Some U.S. exports will become slightly more expensive, and some imports will become more competitive, but the total effect is small. This is largely attributable to a) the relatively small price increases for U.S. goods as a result of environmental requirements; b) the lack of import competition for many commodities which may experience price increases because of the weight, bulk, or U.S. quality requirements for those goods; and c) the enactment by many competing countries of stringent environmental regulations that will reduce any comparative advantage their industries might have over U.S. firms.

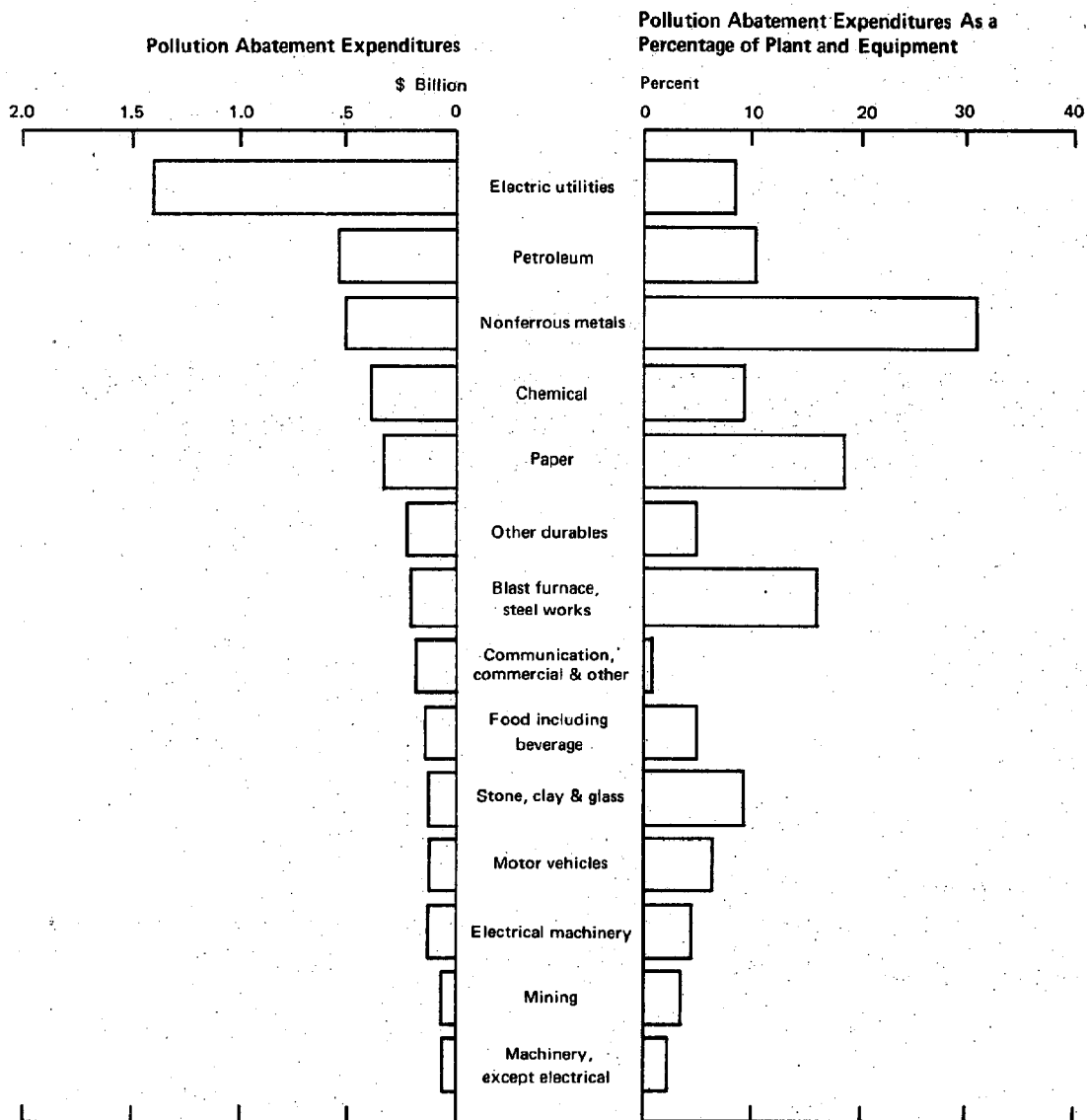
Impact on the Distribution of Income: CEQ and EPA have sponsored studies of the impact of pollution control programs on the distribution of income. These analyses are presently being updated by CEQ.¹³ They show that the medium income family paid approximately 0.5 percent of its family income for incremental pollution control expenditures in 1972 in the form of higher products prices, higher tax revenues, and increased service charges for government services. In 1976, this percentage is expected to increase to about 2.0 percent, falling slightly by 1980. In 1976 and 1980 the increased costs are expected to be relatively evenly divided between higher automobile expenditures, higher prices for other goods and services, and higher taxes.

The distributional impact of these expenditures is expected to be mildly regressive. That is, lower income families will pay a slightly higher proportion of their income (although a much smaller dollar amount) for pollution control expenditures than higher income families.

Impacts on Specific Industries

The previous analyses indicated that there was unlikely to be any significant macroeconomic impact of environmental programs. However, the impacts are not spread evenly across all sectors.

FIGURE IV
Pollution Abatement Expenditures for New Plant and Equipment by Selected Industries, 1973



Source: U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, vol. 54, July 1974

Some industries pollute much more heavily than others and will therefore have to undertake significantly greater efforts to abate their pollution to acceptable levels. Figures IV and V summarize the BEA findings about the relative level of investments being made for pollution control among different industries. Clearly, the industries which would appear to be most significantly affected are:

- Electric utilities
- Petroleum refining
- Iron and steel
- Pulp and paper
- Nonferrous metals
- Stone, clay, glass, and cement
- Chemicals
- Food and kindred products

These eight industrial groupings account for four-fifths of the total estimated private pollution control investments in 1974. The proportion of total plant and equipment investment spent for pollution control purposes in these industries -- ranging from 10 to 20 percent -- is substantially above the national average -- less than 6 percent. Of course, a high proportion of total plant and equipment expenditures being allocated to pollution control may indicate only that the particular industry is investing relatively little for capacity expansion in the United States.

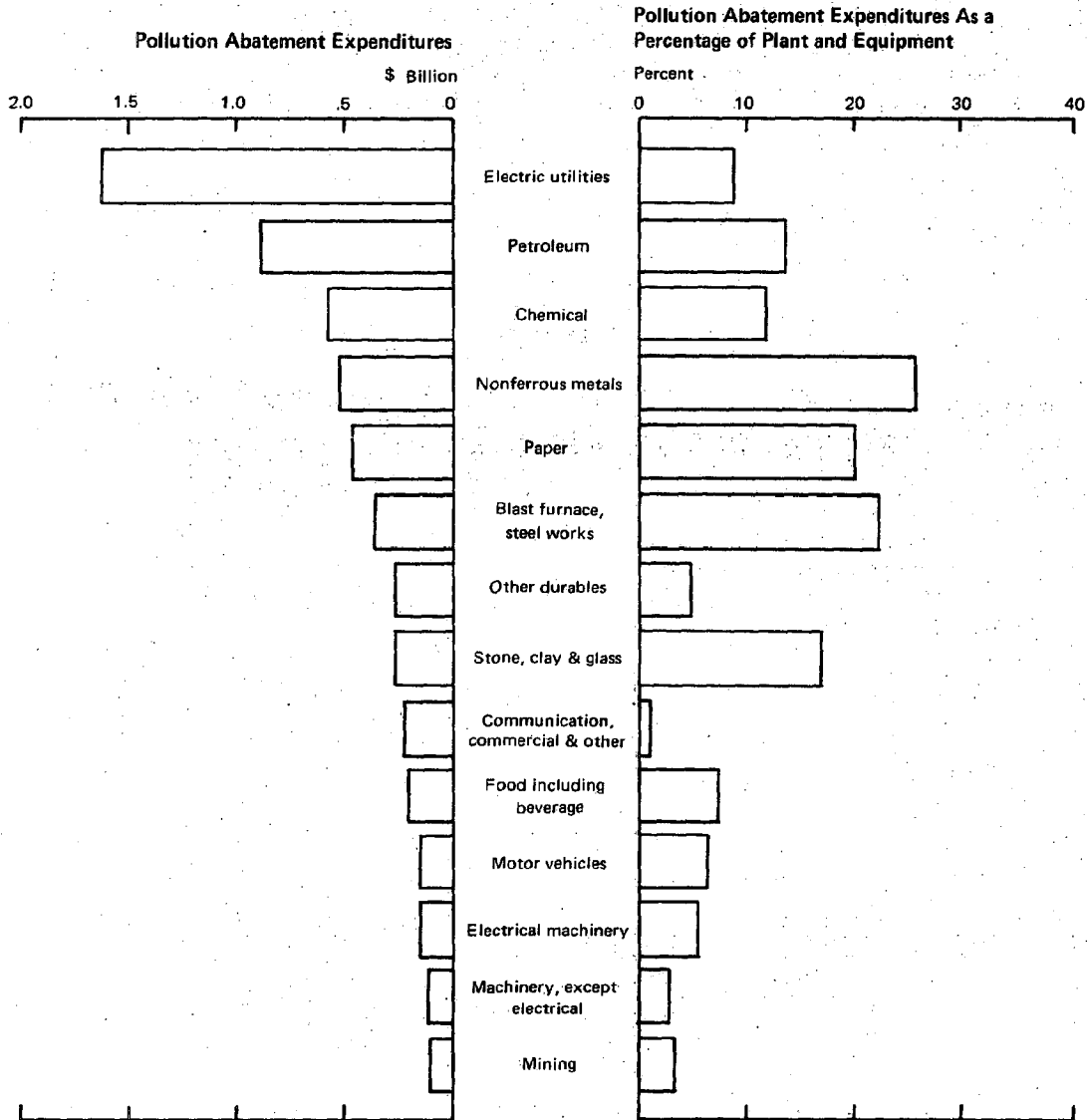
As Tables II and III indicate, all of these industries are expecting to increase their pollution control investments substantially in 1974 over the 1973 levels. Specifically, the expected increase will amount to:

- 17% for electric utilities
- 67% for petroleum refining
- 65% for iron and steel
- 39% for pulp and paper
- 6% for nonferrous metals
- 100% for stone, clay, glass, and cement
- 20% for chemicals
- 52% for food and kindred products

CEQ and EPA estimates indicate that these industries will continue to experience relatively heavily pollution control expenditures throughout the decade.

FIGURE V

Pollution Abatement Expenditures for New Plant and Equipment by Selected Industries, 1974



Source: U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, vol. 54, July 1974

Other important characteristics of the industries are that:

- they are all "basic industries," which means that these price and supply problems ripple through the economy.
- they are generally energy-intensive industries and (excluding electric utilities) account for more than 73 percent of all energy consumed by all industries, and nearly 20 percent of total U.S. energy consumption. In these industries energy is a significant cost element accounting for nearly 14¢ per dollar of value added, compared to the average of all industries of 4¢ per dollar of value added.¹³ Therefore these industries face serious cost problems because of high energy prices in addition to the costs added by environmental regulations (see Table VII).

Table VIII, however, indicates that even in those relatively most seriously affected industries, environmental expenditures are not a large proportion of total value added in the industry and therefore should not have a substantial impact upon prices or output.

Such projected increases and output reductions would not normally be cause for alarm. However, because of the importance of these industries to the functioning of the economy, the possibility of very tight capital markets' limiting the availability of investment funds, and in some cases, a recent history of depressed profits, further analysis is clearly required. CEQ and EPA are presently in the process of sponsoring such studies.

TABLE VII

MANUFACTURING ENERGY CONSUMPTION, SELECTED INDUSTRIES, 1967

Industry	Energy consumed per \$ of output (MBTU/\$)	Total energy consumption (Trillion Btus)	% Manufacturing Consumption	% U. S. Consumption
Cement	463.0	463	3.1%	0.9%
Petroleum	495.2	2537	17.4	5.0
Metals	250.1	4080	27.9	8.1
Paper	140.1	1156	7.9	2.3
Chemicals	138.3	<u>2460</u>	<u>16.8</u>	<u>4.9</u>
Subtotal		10,596	73.3	21.2
All other manufacturing	20.9	3914	26.7	7.7
Total industrial	(69.7) <u>L</u>	14,608	100%	28.9%

L/ Represents the average.

Source:

Energy and Environmental Analysis, Inc., "Energy Management in Manufacturing, 1967-1990," 1974, prepared for CEQ.

TABLE VIII

POLLUTION CONTROL EXPENDITURES AS A PERCENTAGE
OF VALUE OF SHIPMENTS, SELECTED INDUSTRIES, 1973 and 1980

SIC Industrial sector	Value of shipments (\$ million) ^{1/}		Costs ^{2/} as a percentage of value of shipments	
	1973	1980	1973	1980
26 Paper & pulp	\$28,167.4	\$39,715.5	0.42%	0.88%
28 Chemical	57,061.5	80,456.7	0.40	0.86
29 Petroleum refining	28,602.2	40,329.1	0.43	0.99
32 Stone, clay & glass	21,430.0	30,216.3	0.25	0.56
33 Primary metals	58,276.5	82,169.9	0.80	2.00
(Five industry average)				
			0.50	1.00
(All manufacturing average)			0.20	0.50

^{1/} 5% annual increase 1973-80.

^{2/} Calculated on basis of annual costs.

Sources: Value of shipments figures for 1973 are from the Department of Commerce.

References

1. See the CEQ annual reports, Environmental Quality-1970; Environmental Quality-1971, Ch. 4; Environmental Quality-1972, Ch. 8; Environmental Quality-1973, Ch. 3: (U.S. Government Printing Office).
2. Environmental Protection Agency, The Cost of Clean Air, Ch. 3: (U.S. Government Printing Office, 1974).
3. Environmental Protection Agency, The Economics of Clean Water-1973 (U.S. Government Printing Office, 1974).
4. A list of items providing a more extended description of data sources and assumptions made in estimating abatement costs appears on page 24.
5. John E. Cremeans, "Capital Expenditures by Business for Air and Water Pollution Abatement, 1973 and Planned 1974," Survey of Current Business, Vol. 54, July 1974), pp. 58-64.
6. Chase Econometric Associates, Inc., "The Economic Impact of Pollution Control," prepared for CEQ and EPA, 1974.
7. Chase Econometric Associates, Inc., "The Economic Impact of Pollution Control: Macroeconomic and Industry Results - Executive Summary," prepared for EPA, 1973.
8. Charles L. Schultze and Allen V. Kneese, Pollution: Prices and Public Policy (Washington, D.C.: The Brookings Institution, 1974), to be released in December; and information provided by Charles L. Schultze.
9. The Chase analyses conclude that for every dollar of pollution control investment made, 40¢ of other private domestic investment will be displaced, and most of this displacement will occur in the residential housing sector because it is particularly sensitive to the higher interest rates which would result from increased demands on the capital market.
10. John E. Cremeans, supra note 5, p. 64.

11. The 1972 Amendments to the Federal Water Pollution Control Act, for instance, require industries disposing of their wastes in municipal systems to reimburse the municipality fully for all costs incurred. The municipality will be able to keep out those revenues representing its own expenditures but also some portion of the revenues covering Federal expenditures.
12. Department of Commerce, The Effects of Pollution Abatement on International Trade (U.S. Government Printing Office, 1973 and 1974).
13. Nancy Dorfman and Arthur Snow, "Who Bears the Cost of Pollution Control?" prepared for CEQ and EPA by Public Interest Economics Center, Inc., 1973, available from the National Technical Information Service, Department of Commerce (PB-226 447). The CEQ update is expected soon.

Notes on Methodology

Incremental costs were assumed to equal total costs in the following areas: noise, radiation, land reclamation, utilities, thermal water pollution control, control of air pollution from public sources (solid waste and sewage sludge incineration), and mobile sources.

The selection of the discount rates to be used in amortizing capital costs affects the annual cost estimates. In general, a rate of 8 percent has been used for private investment, 10 percent for mobile sources, and 6 percent for public investment. All three rates are probably below the economists' estimates of the "opportunity costs" of investment funds, and they are below interest rates experienced during the past year. Using these rates tends to understate the financial costs of investments made during such high interest rate periods. However, not all investments are financed by borrowing. The assumption that they all are, which underlies the CEQ cost analyses, tends to overstate the financial costs.

Other Analyses on Economic Impact of Environmental Programs
Released by CEQ

Available from the Council*

Date

"Cost of Pollution Abatement"
(from 1974 CEQ Annual Report),
pp. 173-197

1974

"Calculating Abatement Costs"
(from 1974 CEQ Annual Report),
pp. 219-226

1974

"The Macroeconomic Impact of Pollution
Control Programs by Chase Econometrics",
Inc.

1974

Impact of Pollution Abatement on
Income Distribution

1975

Available from the U.S. Government
Printing Office

1973 CEQ Annual Report, Environmental
Quality: 1973, "Economics and Environ-
mental Management," Chapter 3, pp. 73-
117

1973

1972 CEQ Annual Report, Environmental
Quality: 1972, "The Costs and Eco-
nomic Impacts of Environmental Improve-
ment," Chapter 8, pp. 269-309

1972

1971 CEQ Annual Report, Environmental
Quality: 1971, "The Economy and the
Environment," Chapter 4, pp. 99-153

1971

The Economic Impact of Pollution Control - A Summary of
Recent Studies. Prepared for the Council on Environmental
Quality, Department of Commerce, and Environmental Protection
Agency. 1972.

CEQ also has a few copies of the results of the BEA survey
on pollution abatement costs reprinted from the July 1974
Survey of Current Business.

Available from NTIS*

The Economic Impact of Pollution Control - A Summary of Recent Studies. Prepared for the Council on Environmental Quality, Department of Commerce, and Environmental Protection Agency. 1972. (PB-207 205, \$3.75; microfiche, \$2.25)

The Economic Impacts of Meeting [Automobile] Exhaust Emission Standards, 1971-1980. Chase Econometric Associates, Inc.

Part I. Executive Summary. (PB-207 200, \$3.25; \$2.25)
Part II. Baseline Forecasts of Economic Performance. (PB-207 201, \$3.75; \$2.25)

Part III. The Economic Impact of Pollution Abatement. (PB-207 202, \$3.75; \$2.25)

Part IV. Appendix. Presentation of Baseline and Alternative Impact Forecasts of Macroeconomic and Industry Performance. (PB-207 203 \$5.75; \$2.25)

Analysis of Economic Impacts of Environmental Standards on the Bakery Industry. Ernst & Ernst.

Part I. Executive Summary. (PB-207 169; \$3.25; \$2.25)

Part II. [A descriptive analysis of the bakery products industry detailing industry trends and characteristics relevant to economic impact analysis of environmental standards]. (PB-207 170, \$3.25; \$2.25)

Part III. [A study of the impact of pollution standards and charges on the bakery industry]. (PB-207 171, \$3.75; \$2.25)

The Cement Industry: Economic Impact of Pollution Control Costs. The Boston Consulting Group, Inc.

Volume I. Executive Summary. (PB-207 150, \$3.25; \$2.25)

Volume II. [Industry description, pollution problems, market structure, financial resources, demand, foreign trade, and employment impact]. (PB-207 151, \$7.00; \$2.25)

* Prices as of November 15, 1974. Prepaid orders should be sent to the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151.

Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries. National Economic Research Associates, Inc.

Volume I. Executive Summary. (PB-207 168, \$3.25; \$2.25)
Volume II. [Introduction, structure of the electric utility industry, and the economic impact of pollution abatement upon the industry and upon selected power intensive consumer industries]. (PB-207 167, \$5.25; \$2.25)

Economic Impact of Environmental Controls on the Fruits and Vegetable Canning and Freezing Industries. Agri Division, Dunlap and Associates, Inc.

Part I. Executive Summary. (PB-207 140; \$3.25; \$2.25)

Part II. Industry Structure. (PB-207 141, \$5.75; \$2.25)

Part III. Impact Analysis. (PB-207 142, \$6.25; \$2.25)

Part IV. Statistical Supplement. (PB-207 143, \$5.75; \$2.25)

Study of the Economic Impacts of Pollution Control on the Iron Foundry Industry. A.T. Kearney & Company, Inc.

Part I. Executive Summary. (PB-207 147, \$3.25; \$2.25)

Part II. The Structure of the Industry. (PB-207 148, \$5.25; \$2.25)

Part III. The Economic Impact of Pollution Abatement upon the Industry. (PB-207 149, \$4.25; \$2.25)

The Leather Industry: A Study of the Impact of Pollution Control Costs. Urban Systems Research & Engineering, Inc.

Volume I. Executive Summary. (PB-207 152, \$3.75; \$2.25)

Volume II. Description of the Industry. (PB-207 153, \$6.25; \$2.25)

Volume III. Impact of Pollution Control Costs on the Tanning Industry. (PB-207 154, \$3.75; \$2.25)

The Effects of Pollution Control on the Nonferrous Metals Industries. Charles River Associates Incorporated.

Aluminum: Part I. Introduction and Executive Summary (PB-207 164, \$3.75; \$2.25)

Part II. Structure of the Industry. (PB-207 165, \$5.25; \$2.25)

Part III. The Economic Impact of Pollution Abatement on the Industry. (PB-207 166, \$3.75; \$2.25)

Copper: Part I. Introduction and Executive Summary. (PB-207 161, \$3.75; \$2.25)
Part II. Structure of the Industry. (PB-207 162, \$5.25; \$2.25)
Part III. The Economic Impact of Pollution Abatement on the Industry. (PB-207 163, \$3.75; \$2.25)

Lead: Part I. Introduction and Executive Summary. (PB-207 155, \$3.75; \$2.25)
Part II. Structure of the Industry. (PB-207 156, \$4.75; \$2.25)
Part III. The Economic Impact of Pollution Abatement on the Industry. (PB-207 157, \$3.75; \$2.25)

Zinc: Part I. Introduction and Executive Summary. (PB-207 158, \$3.75; \$2.25)

Part II. Structure of the Industry. (PB-207 159, \$4.75; \$2.25)

Part III. The Economic Impact of Pollution Abatement on the Industry. (PB-207 160, \$3.75; \$2.25)

Economic Impact of Anticipated Paper Industry Pollution-Abatement Costs. Arthur D. Little, Inc.
Part I. Executive Summary. (PB-207 144, \$3.25; \$2.25)
Part II. Industry Structure. (PB-207 145, \$4.25; \$2.25)
Part III. Economic Analysis. (PB-207 146, \$4.25; \$2.25)

The Impact of Costs Associated with New Environmental Standards upon the Petroleum Refining Industry. Stephen Sobotka & Company.

Part I. Executive Summary. (PB-207 197, \$3.25; \$2.25)
Part II. Structure of the Industry. (PB-207 198, \$4.25; \$2.25)
Part III. The Impact of Environmental Control Costs. (PB-207 199, \$4.25; \$2.25)

A study of the Economic Impact on the Steel Industry of the Costs of Meeting Federal Air and Water Pollution Abatement Requirements. Booz-Allen Public Administration Services, Inc.
Volume I. Executive Summary. (PB-211 917, \$3.25; \$2.25)
Volume II. The Structure of the Steel Industry. (PB-211 918, \$5.25; \$2.25)
Volume III. Economic Analysis. (PB-211 919, \$5.75; \$2.25)
Volume I, II, III. (PB-211 920, \$12.00)

The Chase Econometrics Macroeconomic and Inter-Industry Forecasting Models. Chase Econometric Associates, Inc.
(PB-207 204, \$5.25; \$2.25)

Who Bears the Cost of Pollution Control?: The Impact on the Distribution of Income of Financing Federally Required Pollution Control. Public Interest Economics Center. 1973.
(PB-226 447, \$5.75; microfiche, \$2.25)

THE ECONOMIC IMPACT OF ENVIRONMENTAL PROGRAMS

ERRATA SHEET

Last paragraph on page 5 should read:

In 1974, the estimated incremental real resource (investment plus O&M) abatement costs amounted to approximately 1.0 percent of the U.S. Gross National Product. This proportion is expected to increase to approximately 1.7 percent in 1976, and then decrease thereafter as investment costs decrease and GNP continues to grow.

Tables II and III, pages 4 and 6

Figures are in millions of dollars not thousands of dollars.

Page 17

In both industrial lists on this page, the lines that read "nonferrous and primary metals" should read only "nonferrous metals".

